DCI QA/QC, MLR, 01/16/01

17 January 1968

MEMORANDUM FOR THE RECORD

SUBJECT: Estimate of the Asymptotic Value of the
            Results of an Iterative Procedure

It often happens in carrying out an iterative procedure that the
first few steps of the iterative will provide answers which fluctuate
widely, but that, as the procedure continues, the changes from one
iteration to the next are small and relatively well behaved. Further-
more, the approach to the final value is likely to slide in asymptotically.
In this circumstance it is often possible to estimate the asymptotic
value reasonably well, without going through the very large number of
variations to arrive at it. The estimate of this asymptote is

$$\hat{G} = \frac{G_{N-1}^2 - G_N G_{N-2}}{2G_{N-1} - G_N - G_{N-2}}$$

where $\hat{G}$ is the desired asymptote, and G_N, G_{N-1} and G_{N-2} are the
estimates at the end of the N-th, (N-1)st, and (N-2)nd iterations,
respectively.

In order to use this estimate it has been assumed that all of the G's
are positive, that the denominator of the estimating equation is positive,
G is a function being maximized, and

$$G_N > G_{N-1} > G_{N-2}$$

One use of this asymptotic estimate is as a means for deciding
when it is not worthwhile to continue the iteration procedure. The
cutoff criterion can be of the form

$$\frac{\hat{G} - G_N}{\hat{G}} < E .$$

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